

New Fossil Scaphelline Volutes from the Pliocene of Southern Florida

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ABSTRACT Three new scaphelline volutes, belonging to the genera *Scaphella* and *Volutifusus*, are described from Pliocene formations in southern Florida. The new taxa include *Scaphella kendrae* n. sp. from the Sarasota Member, Murdock Formation (Zanclean Age), *Volutifusus dougsheltoni* n. sp. from the Buckingham Member, Tamiami Formation (early Piacenzian Age), and *Volutifusus kissimmeensis* n. sp. from the Fruitville Member (Unit 2 Kissimmee facies equivalent), Tamiami Formation (late Piacenzian Age).

KEY WORDS Volutidae, Scaphellinae, *Scaphella*, *Volutifusus*, Florida, Sarasota, Kissimmee River, Pliocene Epoch, Zanclean Age, Piacenzian Age, Murdock Formation, Tamiami Formation, *Scaphella kendrae*, *Volutifusus dougsheltoni*, *Volutifusus kissimmeensis*

INTRODUCTION

The scaphelline volutid genera *Scaphella* Swainson, 1832 and *Volutifusus* Conrad, 1863 are commonly-encountered taxa in the Pliocene and Pleistocene fossil beds of southern Florida. Recent taxonomic surveys of the fossil malacofaunas of southern Florida have shown that fifteen species of *Scaphella* and six species of *Volutifusus* were known from the fossil record, with the bulk of the species having been found in the Piacenzian Pliocene Tamiami Formation, the Gelasian Pleistocene Caloosahatchee Formation, and the Chibanian Pleistocene Bermont Formation (Petuch, 1994, 2004; Petuch and Roberts, 2007; Petuch and Berschauer, 2021). All of these scaphelline taxa are stratigraphically and chronologically highly-restricted and they have proven to be invaluable tools, as guide fossils, for determining the boundaries between the members and formations in the regional geology.

While in the process of completing a new comprehensive book on the geology, paleontology, and paleoceanography of the Everglades region, we discovered that three Floridian scaphelline volutes remained undescribed and had not been recognized or illustrated in any previous paleontological surveys. Since these three volutes, a new species of *Scaphella* and two new species of *Volutifusus*, were found to be important, stratigraphically-restricted index fossils for the Pliocene beds, we have decided that they need names and will be included in our upcoming geology book. These include the oldest-known species of *Scaphella* from the Sarasota Member of the Murdock Formation (Zanclean Pliocene), a new elongated *Volutifusus* from the Buckingham Member of the Tamiami Formation (early Piacenzian Pliocene), and a new heavily-sculptured *Volutifusus* from the Fruitville Member of the Tamiami Formation (late Piacenzian Pliocene). The holotypes of the three new species are deposited in the Molluscan Paleontology Collections of the Los

Angeles County Museum of Natural History, Los Angeles, California and bear LACMIP numbers. These three newly-discovered volutes are described in the following sections.

SYSTEMATICS

Class	:	Gastropoda
Subclass	:	Sorbeoconcha
Order	:	Prosobranchia
Infraorder	:	Neogastropoda
Superfamily	:	Volutoidea
Family	:	Volutidae
Subfamily	:	Scaphellinae

Genus *Scaphella* Swainson, 1832

Scaphella kendrae Petuch and Berschauer,
new species
(Figure 1A, B)

Description. Shell small for genus, fusiform, biconic, with elevated spire whorls; shoulder angled, with broadly rounded edge, placed at demarcation line between anterior and posterior halves of body whorl; subsutural areas of spire whorls and shoulder distinctly sloping; siphonal canal proportionally very short, nearly obsolete; aperture moderately wide and flaring; columella with 4 large plicae, with plicae grouped closest to anterior end of shell; posterior half of columella without folds or ornamentation; early whorls smooth, with only faint and poorly-developed small longitudinal ribs on first postnuclear whorl; protoconch proportionally large, rounded and dome-like.

Type Material. HOLOTYPE - Length 42.0 mm, width 18.8 mm, from Unit 11A in Quality Aggregates Pit #6, Sarasota, Florida. LACMIP 43080.1, LACMIP Type 14891.

Type Locality and Stratigraphic Range. The holotype was collected in the upper section of the basal bed (Unit 11 of Petuch, 1982; Petuch and Roberts, 2007; Petuch and Berschauer,

2021) in Quality Aggregates Pit #6 at Sarasota, Sarasota County, Florida. Here, the new species was found to be confined to a single thin indurated sandstone layer on the upper surface of Unit 11 (referred to as "Unit 11A") of the Sarasota Member, Murdock Formation, Zanclean Age of the early Pliocene.

Etymology. Named for Kendra Berentsen of New York City, a gifted opera singer, an avid amateur naturalist, and the daughter-in-law of the senior author.

Discussion. Since the thin sandstone layer on the upper surface of the Sarasota Member of the Murdock Formation has only been seen in one Sarasota quarry (Quality Aggregates Pit #6), only a single specimen of this new *Scaphella* species has ever been collected. The thin layer, referred to as "Unit 11A", was only exposed within a small area and only a few well-preserved gastropods and bivalves were collected. Besides the unique holotype of *Scaphella kendrae*, other Unit 11A mollusks included a small undescribed *Tropochasca* species (Echinofulguridae), an undescribed *Akleistostoma* species (ancestral to the early Piacenzian *A. pilsbryi*, Cypraeidae), an undescribed *Pterorhytis* species (Muricidae), and the pholadomyid bivalve *Margaritaria abrupta*. As the entire underlying Sarasota Member (Murdock Formation) is heavily leached by groundwater from early Pliocene deltas, only calcitic fossils are preserved and are represented by large numbers of barnacles such as *Chesaconcavus*, muricid gastropods such as *Ecphora* and *Planecphora*, and pectinid bivalves such as *Chesapecten*, *Carolinapecten*, and *Cristinapecten* (Petuch, 2004; Petuch and Roberts, 2007; Petuch and Berschauer, 2021). The new molluscan fauna found in Unit 11A, which includes the new volute, is the only-known unit within the Murdock Formation that contains well-preserved aragonitic fossils. The

well-preserved gastropods of this thin layer demonstrates that the ancestral lineages of the remarkable molluscan fauna of the overlying Buckingham Member of the Tamiami Formation were already well-established by the late Zanclean Age.

Of the known Florida *Scaphella* species, the new Murdock Formation volute is most similar to *Scaphella martinshugari* Petuch, 1994 (Figure 1C, D) from the overlying Piacenzian-aged Buckingham Member of the Tamiami Formation, but differs in being a smaller, more slender and less-inflated shell with a much higher and more protracted spire, and in having smoother, less-sculptured early whorls. The distinct shoulder angle, biconic appearance, and short siphonal canal of *Scaphella kendrae* also set it aside from all other known congeners. In having these last three shell characters, along with its small size, the new Unit 11A volute also resembles *Atraktus florea* (Gardner, 1947: 637-638, plate 52, figure 31) from the Shoal River Formation of the Florida Panhandle (Serravallian Age of the Middle Miocene), but differs in having a higher and more protracted spire and in being a less-sculptured shell that lacks the fine longitudinal ribbing seen on the body whorl and spire of *A. florea*. Based on its stratigraphic position within the Zanclean Pliocene beds of southern Florida and the southeastern United States, *Scaphella kendrae* appears to be the oldest-known true *Scaphella* and is ancestral to the taxa that are found in the subsequent Piacenzian Pliocene and Pleistocene formations and members. These descendant taxa are listed here in the following table.

List of Named *Scaphella* Species Known from the Pliocene and Pleistocene of the Florida.

(All the described species of *Scaphella* are arranged here stratigraphically and geochronologically; these are illustrated in

Petuch, 1994, 2004; Petuch and Berschauer, 2021).

Zanclean Age, Pliocene

Scaphella kendrae Petuch and Berschauer, n.sp. (Unit 11A, Sarasota Member, Murdock Formation.). (Oldest-known true *Scaphella* and the morphological transition form between the Middle and Late Miocene genus *Atraktus* and Pliocene-Holocene genus *Scaphella* (*sensu stricto*).

Piacenzian Age, Pliocene

Scaphella martinshugari Petuch, 1994 (Buckingham Member, Tamiami Formation)
Scaphella ashleyae Petuch, 1994 (Buckingham Member, Tamiami Formation)
Scaphella trenholmii (Tuomey and Holmes, 1856) (Pinecrest Member, Tamiami Formation; also known from the Duplin Formation of the Carolinas)
Scaphella mansfieldi Petuch, 1994 (Pinecrest Member, Tamiami Formation; also known from the Duplin Formation of the Carolinas)
Scaphella petiti Petuch, 1994 (Unit 4 Fruitville Member, Tamiami Formation)
Scaphella gravesae Petuch, 1994 (Unit 3 Fruitville Member, Tamiami Formation)
Scaphella maureenae Petuch, 1994 (Unit 3 Fruitville Member, Tamiami Formation)
Scaphella danielleae Petuch, 1994 (Unit 2, Fruitville Member, Tamiami Formation)
Scaphella brennmortoni Olsson and Petit, 1964 (Unit 2, Fruitville Member, Tamiami Formation; also known from the upper beds of the Waccamaw Formation of the Carolinas)

Gelasian Age, Pleistocene

Scaphella floridana Heilprin, 1886 (Fort Denaud Member, Caloosahatchee Formation)
Scaphella tomscotti Petuch, 1994 (Ayers Landing Member, Caloosahatchee Formation)
Scaphella griffini Petuch, 1994 (Ayers Landing Member, Caloosahatchee Formation)
Scaphella oleiniki Petuch, 1994 (Ayers Landing Member, Caloosahatchee Formation)

Chibanian Age, Pleistocene

Scaphella capelettii Petuch, 1994 (Holey Land Member, Bermont Formation)

Scaphella seminole Petuch, 1994 (Holey Land Member, Bermont Formation)

Superfamily : Volutoidea

Family : Volutidae

Subfamily : Scaphellinae

Genus *Volutifusus* Conrad, 1863

Volutifusus dougsheltoni Petuch and Berschauer,
new species
(Figure 1E, F)

Description. Shell of average size for genus, extremely elongated and fusiform, with narrow, cylindrical body whorl and very high, protracted spire; shoulders of spire whorls ornamented with 10-12 large, prominent elongated, evenly-spaced elongated knobs that are arranged longitudinally; spire whorls with 10-12 elongated knobs per whorl; elongated knobs also extend onto first half of body whorl, along apertural side, giving shell pleated, lyriaform appearance; dorsum of body whorl smooth and lacking elongated knobs; aperture elongated and narrow; columella with 2 large widely-spaced plicae; protoconch bulbous, rounded, composed of 2 whorls.

Type Material. HOLOTYPE - Length 118.2 mm, width 37.1 mm, from the Buckingham Member, Tamiami Formation at Sarasota, LACMIP 43081.1, LACMIP Type 14892; OTHER MATERIAL EXAMINED - 2 specimens, lengths 121 mm and 116 mm, from the same locality and stratigraphic unit as the holotype, in the research collection of the senior author; length 71.0 mm, from the same locality and stratigraphic unit as the holotype, in the research collection of Douglas Shelton, Mobile, Alabama; length 74 mm, from the lower bed of the Jackson Bluff Formation (the “*Ecphora*

Zone”) at Alum Bluff, Liberty County, Florida, in the research collection of the senior author.

Type Locality and Stratigraphic Range. The holotype was collected in the basal bed of Unit 10 (Petuch, 1982; Petuch and Roberts, 2007; Petuch and Berschauer, 2021) in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida. Here, the new species was found to be restricted to the Buckingham Member of the Tamiami Formation, early Piacenzian Age of the late Pliocene. Specimens of this new species have also been collected in the contemporaneous lower beds of the Jackson Bluff Formation at Alum Bluff on the Apalachicola River.

Etymology. Named for Douglas Shelton of Mobile, Alabama, well-known local expert on the American Volutidae and who has made many important contributions to our knowledge of the Scaphellinae.

Discussion. Within the Buckingham Member beds at Sarasota, *Volutifusus dougsheltoni* is a rarely-seen species and occurs together with the much more common *Volutifusus emmonsi* Petuch, 1994 (Figure 2D). Although similar in appearance, the new species differs from the more abundant *V. emmonsi* in being a much larger shell (averaging 125 mm as opposed to 80 mm for *V. emmonsi*), in having a much narrower and more elongated shell with a distinctly stretched-out appearance, and in having proportionally-larger, better-developed, and more prominent knobs on the spire whorls. On *V. dougsheltoni*, the spire whorl knobs continue onto the body whorl as elongated plicae, at least as far as half way around the shell. On *V. emmonsi*, the spire whorl knobs are less-developed and end along the penultimate whorl, never extending onto the aperture side of the body whorl.

Volutifusus kissimmeensis Petuch and
Berschauer, new species
(Figure 2A, B, C)

Description. Shell of average size for genus, elongated and cylindrical, with proportionally low spire whorls; body whorl at least two-thirds of overall shell length; shoulder sloping, distinctly angled, sharply-edged on earlier whorls; angled shoulder and spire whorls ornamented with 14-15 prominent, rib-like, evenly-spaced elongated knobs, which extend onto first 3 whorls; elongated knobs diminish in size and disappear on body whorl of fully adult specimens; aperture very long and narrow; columella slightly curved, ornamented with 2 large, prominent plicae; protoconch proportionally large, rounded, dome-like, composed of 2 whorls.

Type Material. HOLOTYPE - Length 78.5 mm, width 30.0 mm, Fruitville Member Unit 2 beds in the Rucks Pit, Fort Drum, Okeechobee County, Florida (broken subadult specimen, LACMIP 43082.1, LACMIP Type 14893); OTHER MATERIAL EXAMINED - length 105 mm (fully adult specimen), from the same locality and stratigraphic unit as the holotype, in the research collection of the senior author.

Type Locality and Stratigraphic Range. The holotype was collected in the uppermost section of the lowest beds in the Rucks Pit, Fort Drum, Okeechobee County, Florida, which represent the Kissimmee Valley facies of the Fruitville Unit 2 equivalent beds of the Tamiami Formation, late Piacenzian Age of the late Pliocene.

Etymology. Named for the Kissimmee River of southern Florida, which now occupies a buried lagoon-like bay, the Kissimmee Embayment of the Pliocene Okeechobean Sea. This ancient

embayment contained the endemic ecosystem that was home to the new species.

Discussion. The new species, *Volutifusus kissimmeensis*, is presently known from only two specimens; a broken fragmentary holotype with well-preserved sculpture and knobs on the early whorls (Figure 2 A, B) and a beach-worn but fully adult specimen with an intact body whorl (Figure 2C). Together, the two specimens allow for an accurate reconstruction of the appearance of a perfect adult shell. The broken specimen was chosen to be the holotype because of the good preservation of the diagnostic sculpture on the spire whorls; this was essentially worn off the more complete specimen. Of the known Florida Pliocene *Volutifusus* species, *V. kissimmeensis* most closely resembles *V. obtusus* (Emmons, 1858) (Figure 2F) from the older Pinecrest Member of the Tamiami Formation, but differs in being a smaller, much more slender shell with noticeably lower spire whorls and in having much stronger, more numerous knobs on the spire whorls. In *V. obtusus*, the knobs on the spire extend only onto the first two postnuclear whorls, while on *V. kissimmeensis* they extend to the third whorl and around to the edge of the body whorl. The new species is also similar to *V. auroraensis* Petuch, 1994 (Figure 2E), which occurs along with *V. kissimmeensis* in the Unit 2 equivalent beds, but differs in having a much more flattened spire with stronger and more numerous rounded spire knobs and in having far less indented sutures.

The two new *Volutifusus* species are part of a large complex of Eastern American species that ranges from the early Miocene (Langhian Age) to the Early Pleistocene (Gelasian Age). Although at least seven *Volutifusus* species are known from the Miocene of Maryland and Virginia (Petuch, 2004), an equal number of species also has been reported from the Pliocene

of Florida and these are listed here by geochronology. A single Early Pleistocene species is known from the Virginia, the Carolinas, and Florida and the genus disappears from the fossil record at the end of Gelasian time. Three species of living *Volutifusus* are also known from deep water areas off the southeastern United States, Bahamas, and Cuba, and include *V. piraticus* (Clench and Aguayo, 1940), *V. torrei* (Pilsbry, 1937), and *V. aguayoi* (Clench, 1940). After disappearing from shallow water areas during the Middle and Late Pleistocene, the genus appears to have found a refugium in these protected deep water environments. The Pliocene and Pleistocene Floridian *Volutifusus* species are listed on the following table.

List of Named *Volutifusus* Species Known from the Pliocene and Pleistocene of Florida.

(All the described *Volutifusus* species are arranged here stratigraphically and geochronologically; these are illustrated in Petuch, 1994, 2004; Petuch and Berschauer, 2021).

Piacenzian Age, Pliocene.

Volutifusus emmonsii Petuch, 1994 (Buckingham Member, Tamiami Formation; also known from the lower beds of the Jackson Bluff Formation at Alum Bluff and the Yorktown Formation of Virginia and North Carolina)

Volutifusus dougsheltoni Petuch and Berschauer, n. sp. (Buckingham Member, Tamiami Formation; also known from the lower beds of the Jackson Bluff Formation at Alum Bluff)

Volutifusus spengleri Petuch, 1994 (Pinecrest Member, Tamiami Formation; also known from the Yorktown Formation of Virginia and Duplin Formation of the Carolinas)

Volutifusus obtusus (Emmons, 1858) (Pinecrest Member, Tamiami Formation; also known from the Yorktown Formation of Virginia and Duplin Formation of the Carolinas)

Volutifusus kissimmeensis Petuch and Berschauer, n.sp. (Unit 2 Fruitville Member, Tamiami Formation.)

Volutifusus auroraensis Petuch, 1994 (Unit 2 Fruitville Member, Tamiami Formation; also found in the Chowan River Formation of Virginia and North Carolina)

Volutifusus typus Conrad, 1866 (Unit 2 Fruitville Member, Tamiami Formation; also found in the Chowan River Formation of Virginia and North Carolina)

Gelasian Age, Pleistocene.

Volutifusus halscotti Petuch, 1994 (Rucks Pit Member, Nashua Formation; also found in the Waccamaw Formation of the Carolinas)

ACKNOWLEDGMENTS

We thank the following mine owners for allowing the senior author access to their quarries, which resulted in the discovery of these new species: Hugh Cannon, Quality Aggregates Inc., Sarasota, Florida and Edwin Rucks Jr., Rucks Pit and Fort Drum Crystal Mine, Fort Drum, Okeechobee County, Florida.

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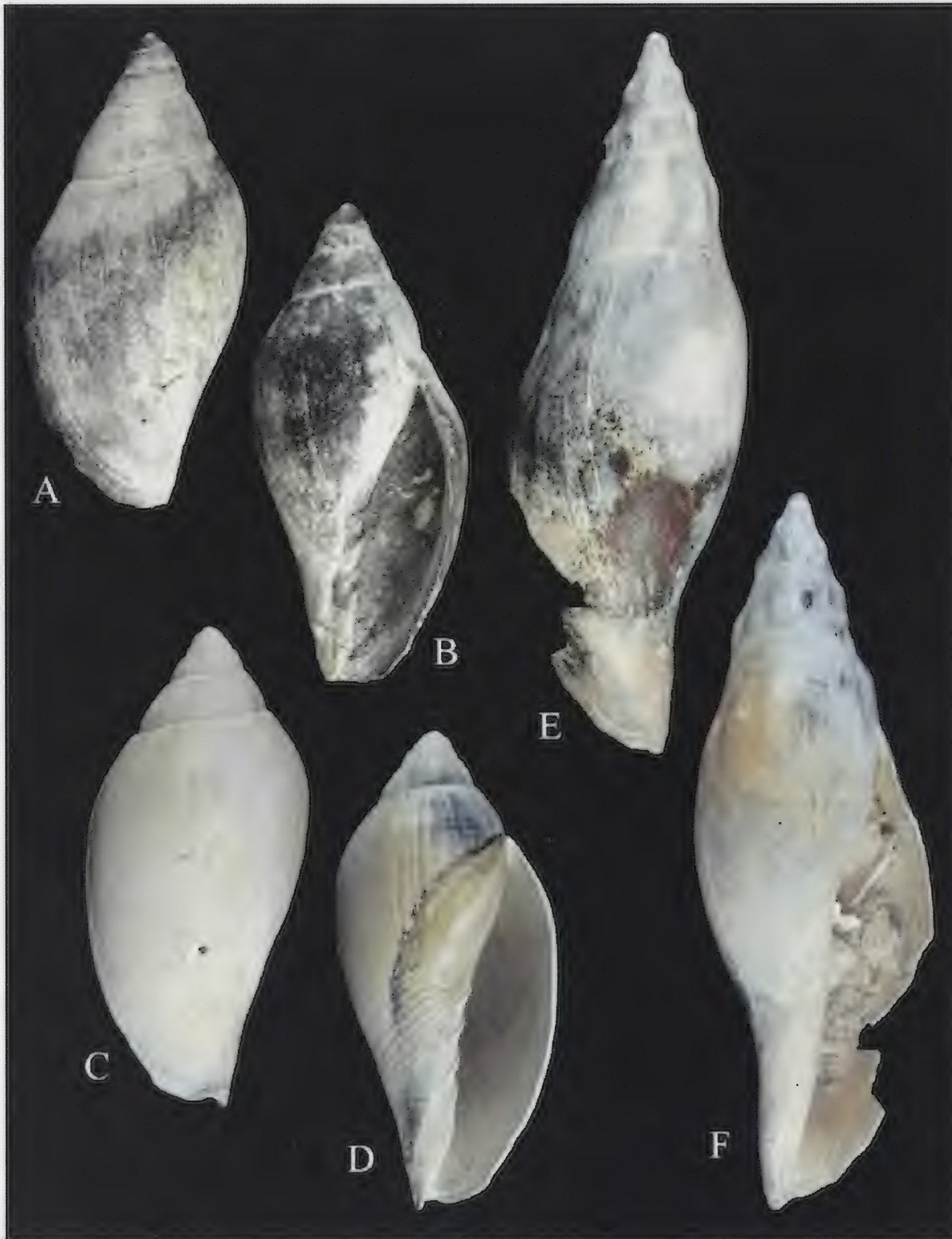


Figure 1. *Scaphella* and *Volutifusus* Species from the Pliocene of Southern Florida.

A, B= *Scaphella kendrae* Petuch and Berschauer, new species, holotype, length 42.0 mm, from the uppermost bed of the Sarasota Member, Murdock Formation, Unit 11A in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida, Zanclean Age of the early Pliocene, LACMIP 14891; **C, D= *Scaphella martinshugari*** Petuch, 1994, length 59.0 mm, from Unit 10 in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida, Buckingham Member, Tamiami Formation, early Piacenzian Age of the late Pliocene (for comparison with *S. kendrae*); **E, F= *Volutifusus dougsheltoni*** Petuch and Berschauer, new species, holotype, length 118.2 mm, from Unit 10 in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida, Buckingham Member, Tamiami Formation, early Piacenzian Age of the late Pliocene, LACMIP 14892.



Figure 2. *Volutifusus* Species from the Pliocene of Southern Florida.

A, B= *Volutifusus kissimmeensis* Petuch and Berschauer, new species, holotype, length 78.5 mm, from the upper section of the lower beds in the Rucks Pit, Fort Drum, Okeechobee County, Florida, Unit 2 Fruitville Member equivalent, Tamiami Formation, late Piacenzian Age of the late Pliocene, LACMIP 14893; **C=** *Volutifusus kissimmeensis* Petuch and Berschauer, new species, length 105 mm, from the upper section of the lower beds in the Rucks Pit, Fort Drum, Okeechobee County, Florida, Unit 2 Fruitville Member equivalent, Tamiami Formation, late Piacenzian Age of the late Pliocene (beach-worn fully adult specimen); **D=** *Volutifusus emmonsii* Petuch, 1994, length 84.2 mm, from Unit 10 in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida, from Unit 10 in Quality Aggregates Pit #6, Sarasota, Sarasota County, Florida, Buckingham Member, Tamiami Formation, early Piacenzian Age of the late Pliocene; **E=** *Volutifusus auroraensis* Petuch, 1994, length 110 mm, from the old Lee Creek Phosphate Mine, Aurora, Beaufort County, North Carolina, Chowan River Formation, late Piacenzian Age of the late Pliocene (also found in Unit 2 equivalent Fruitville Member beds of the Tamiami Formation in southern Florida; for comparison with *V. kissimmeensis*); **F=** *Volutifusus obtusus* (Emmons, 1858), length 130 mm, from the lowest beds exposed in the Rucks Pit, Fort Drum, Okeechobee County, Florida, Pinecrest Member equivalent, Tamiami Formation, late Piacenzian Age of the late Pliocene (for comparison with *V. kissimmeensis*).